

N(1875) 3/2⁻ $I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$ Status: ***

Before the 2012 Review, all the evidence for a $J^P = 3/2^-$ state with a mass above 1800 MeV was filed under a two-star $N(2080)$.

There is now evidence from ANISOVICH 12A for two $3/2^-$ states in this region, so we have split the older data (according to mass) between a three-star $N(1875)$ and a two-star $N(2120)$.

The latest GWU analysis (ARNDT 06) finds no evidence for this resonance.

NODE=B016

NODE=B016

N(1875) BREIT-WIGNER MASS

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
1820 to 1920 (≈ 1875) OUR ESTIMATE			
1880± 20	ANISOVICH	12A	DPWA Multichannel
1920	BELL	83	DPWA $\pi^- p \rightarrow \Lambda K^0$
1880±100	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$
1900	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1951± 27	SHRESTHA	12A	DPWA Multichannel
2048± 65	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1946± 1	PENNER	02C	DPWA Multichannel
1895	MART	00	DPWA $\gamma p \rightarrow \Lambda K^+$
2003± 18	VRANA	00	DPWA Multichannel
1804± 55	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
1880	BAKER	79	DPWA $\pi^- p \rightarrow n\eta$

NODE=B016M

NODE=B016M

→ UNCHECKED ←

N(1875) BREIT-WIGNER WIDTH

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
160 to 320 (≈ 220) OUR ESTIMATE			
200± 25	ANISOVICH	12A	DPWA Multichannel
320	BELL	83	DPWA $\pi^- p \rightarrow \Lambda K^0$
180± 60	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$ (lower m)
240	SAXON	80	DPWA $\pi^- p \rightarrow \Lambda K^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
500± 45	SHRESTHA	12A	DPWA Multichannel
529±128	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
859± 7	PENNER	02C	DPWA Multichannel
372	MART	00	DPWA $\gamma p \rightarrow \Lambda K^+$
1070±858	VRANA	00	DPWA Multichannel
450±185	MANLEY	92	IPWA $\pi N \rightarrow \pi N & N\pi\pi$
87	BAKER	79	DPWA $\pi^- p \rightarrow n\eta$

NODE=B016W

NODE=B016W

→ UNCHECKED ←

N(1875) POLE POSITION

REAL PART	DOCUMENT ID	TECN	COMMENT
1800 to 1950 OUR ESTIMATE			
1860± 25	ANISOVICH	12A	DPWA Multichannel
1880±100	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$ (lower m)
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1975	SHRESTHA	12A	DPWA Multichannel
1957± 49	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$
1824	VRANA	00	DPWA Multichannel
not seen	ARNDT	91	DPWA $\pi N \rightarrow \pi N$ Soln SM90

NODE=B016215

NODE=B016RE

NODE=B016RE

→ UNCHECKED ←

-2×IMAGINARY PART	DOCUMENT ID	TECN	COMMENT
150 to 250 OUR ESTIMATE			
200± 20	ANISOVICH	12A	DPWA Multichannel
160± 80	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$ (lower m)

NODE=B016IM

NODE=B016IM

→ UNCHECKED ←

• • • We do not use the following data for averages, fits, limits, etc. • • •

495	SHRESTHA	12A	DPWA	Multichannel
467±106	BATINIC	10	DPWA	$\pi N \rightarrow N\pi, N\eta$
614	VRANA	00	DPWA	Multichannel
not seen	ARNDT	91	DPWA	$\pi N \rightarrow \pi N$ Soln SM90

N(1875) ELASTIC POLE RESIDUE

MODULUS | r |

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2 to 10 OUR ESTIMATE			
2.5±1.0	ANISOVICH	12A	DPWA Multichannel
10 ± 5	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$ (lower m)
• • • We do not use the following data for averages, fits, limits, etc. • • •			
53	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$

NODE=B016220

NODE=B016RER
 NODE=B016RER
 → UNCHECKED ←

PHASE θ

VALUE (°)	DOCUMENT ID	TECN	COMMENT
100±80	¹ CUTKOSKY	80	IPWA $\pi N \rightarrow \pi N$ (lower m)
• • • We do not use the following data for averages, fits, limits, etc. • • •			
- 65	BATINIC	10	DPWA $\pi N \rightarrow N\pi, N\eta$

NODE=B016IMR
 NODE=B016IMR

N(1875) INELASTIC POLE RESIDUE

The “normalized residue” is the residue divided by $\Gamma_{pole}/2$.

Normalized residue in $N\pi \rightarrow N(1875) \rightarrow \Lambda K$

MODULUS (%)	DOCUMENT ID	TECN	COMMENT
1.5±0.5	ANISOVICH	12A	DPWA Multichannel

NODE=B016250

NODE=B016250

NODE=B016RS1
 NODE=B016RS1

Normalized residue in $N\pi \rightarrow N(1875) \rightarrow \Sigma K$

MODULUS (%)	DOCUMENT ID	TECN	COMMENT
4±2	ANISOVICH	12A	DPWA Multichannel

NODE=B016RS2
 NODE=B016RS2

Normalized residue in $N\pi \rightarrow N(1875) \rightarrow N\sigma$

MODULUS (%)	PHASE (°)	DOCUMENT ID	TECN	COMMENT
8±3	- 170 ± 65	ANISOVICH	12A	DPWA Multichannel

NODE=B016RS3
 NODE=B016RS3

N(1875) DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor	
Γ_1 $N\pi$	(12 ± 10) %		DESIG=1
Γ_2 $N\eta$	(3.5 ± 3.5) %		DESIG=2
Γ_3 $N\omega$	(21 ± 7) %	2.5	DESIG=12
Γ_4 ΛK			DESIG=3
Γ_5 ΣK	(7 ± 4) × 10 ⁻³		DESIG=4
Γ_6 $N\pi\pi$			DESIG=5
Γ_7 $\Delta(1232)\pi$, S-wave	(40 ± 10) %		DESIG=21
Γ_8 $\Delta(1232)\pi$, D-wave	(17 ± 10) %		DESIG=22
Γ_9 $N\rho$, $S=3/2$, S-wave	(6 ± 6) %		DESIG=23
Γ_{10} $N(\pi\pi)^{I=0}_{S\text{-wave}}$	(24 ± 24) %		DESIG=24
Γ_{11} $n\gamma$, helicity=1/2			DESIG=8
Γ_{12} $n\gamma$, helicity=3/2			DESIG=9
Γ_{13} $p\gamma$	0.008–0.016 %		DESIG=10;OUR EST
Γ_{14} $p\gamma$, helicity=1/2	0.006–0.010 %		DESIG=6;OUR EST
Γ_{15} $p\gamma$, helicity=3/2	0.002–0.006 %		DESIG=7;OUR EST

N(1875) BRANCHING RATIOS **$\Gamma(N\pi)/\Gamma_{\text{total}}$**

VALUE (%)

12±10 OUR ESTIMATE

3± 2

10± 4

• • • We do not use the following data for averages, fits, limits, etc. • • •

7± 2

17± 7

12± 2

13± 3

23± 3

DOCUMENT ID

TECN

COMMENT

ANISOVICH

12A DPWA Multichannel

1 CUTKOSKY

80 IPWA $\pi N \rightarrow \pi N$ (lower m) **Γ_1/Γ**

NODE=B016230

NODE=B016R1

NODE=B016R1

→ UNCHECKED ←

 $\Gamma(N\eta)/\Gamma_{\text{total}}$

VALUE (%)

3.5±3.5 OUR AVERAGE

Error includes scale factor of 2.5.

7 ± 2

0 ± 2

• • • We do not use the following data for averages, fits, limits, etc. • • •

8 ± 3

DOCUMENT ID

TECN

COMMENT

PENNER

02C DPWA Multichannel

VRANA

00 DPWA Multichannel

 Γ_2/Γ

NODE=B016R7

NODE=B016R7

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow N\eta$

VALUE (%)

6 ±4 OUR ESTIMATE

5 ± 2

6.5

DOCUMENT ID

TECN

COMMENT

ANISOVICH

12A DPWA Multichannel

BAKER

79 DPWA $\pi^- p \rightarrow n\eta$ **$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$**

NODE=B016R2

NODE=B016R2

→ UNCHECKED ←

 $\Gamma(N\omega)/\Gamma_{\text{total}}$

VALUE (%)

21±7

DOCUMENT ID

TECN

COMMENT

PENNER

02C DPWA Multichannel

 Γ_3/Γ

NODE=B016R14

NODE=B016R14

 $\Gamma(\Lambda K)/\Gamma_{\text{total}}$

VALUE (%)

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.2±0.2

DOCUMENT ID

TECN

COMMENT

PENNER

02C DPWA Multichannel

 Γ_4/Γ

NODE=B016R12

NODE=B016R12

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow \Lambda K$

VALUE (%)

4±2 OUR ESTIMATE

4±2

4

3

DOCUMENT ID

TECN

COMMENT

ANISOVICH

12A DPWA Multichannel

BELL

83 DPWA $\pi^- p \rightarrow \Lambda K^0$

SAXON

80 DPWA $\pi^- p \rightarrow \Lambda K^0$ **$(\Gamma_1\Gamma_4)^{1/2}/\Gamma$**

NODE=B016R3

NODE=B016R3

→ UNCHECKED ←

 $\Gamma(\Sigma K)/\Gamma_{\text{total}}$

VALUE (%)

0.7±0.4

DOCUMENT ID

TECN

COMMENT

PENNER

02C DPWA Multichannel

 Γ_5/Γ

NODE=B016R13

NODE=B016R13

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow \Sigma K$

VALUE (%)

1 to 10 OUR ESTIMATE

15 ± 8

1.4 to 3.7

DOCUMENT ID

TECN

COMMENT

ANISOVICH

12A DPWA Multichannel

2 DEANS

75 DPWA $\pi N \rightarrow \Sigma K$ **$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$**

NODE=B016R4

NODE=B016R4

→ UNCHECKED ←

 $(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow \Delta(1232)\pi, S\text{-wave}$

VALUE

DOCUMENT ID

TECN

COMMENT

• • • We do not use the following data for averages, fits, limits, etc. • • •

-0.09±0.09

MANLEY

92 IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$ **$(\Gamma_1\Gamma_5)^{1/2}/\Gamma$**

NODE=B016R21

NODE=B016R21

 $\Gamma(\Delta(1232)\pi, S\text{-wave})/\Gamma_{\text{total}}$

VALUE (%)

40±10

• • • We do not use the following data for averages, fits, limits, etc. • • •

87± 3

DOCUMENT ID

TECN

COMMENT

VRANA

00 DPWA Multichannel

 Γ_7/Γ

NODE=B016R10

NODE=B016R10

$(\Gamma_1 \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow \Delta(1232)\pi$, D-wave $(\Gamma_1 \Gamma_8)^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

+0.22 ± 0.07 MANLEY 92 IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

$\Gamma(\Delta(1232)\pi, \text{D-wave}) / \Gamma_{\text{total}}$ Γ_8 / Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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17 ± 10

VRANA 00 DPWA Multichannel

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 6 SHRESTHA 12A DPWA Multichannel

$(\Gamma_1 \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow N\rho, S=3/2, S\text{-wave}$ $(\Gamma_1 \Gamma_9)^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

-0.24 ± 0.06 MANLEY 92 IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

$\Gamma(N\rho, S=3/2, S\text{-wave}) / \Gamma_{\text{total}}$ Γ_9 / Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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6 ± 6

VRANA 00 DPWA Multichannel

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 5 SHRESTHA 12A DPWA Multichannel

$(\Gamma_1 \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\pi \rightarrow N(1875) \rightarrow N(\pi\pi)_{S\text{-wave}}^{I=0}$ $(\Gamma_1 \Gamma_{10})^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

+0.25 ± 0.06 MANLEY 92 IPWA $\pi N \rightarrow \pi N$ & $N\pi\pi$

$\Gamma(N(\pi\pi)_{S\text{-wave}}^{I=0}) / \Gamma_{\text{total}}$ Γ_{10} / Γ

VALUE (%)	DOCUMENT ID	TECN	COMMENT
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24 ± 24

VRANA 00 DPWA Multichannel

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 4 SHRESTHA 12A DPWA Multichannel

$(\Gamma_1 \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $p\gamma \rightarrow N(1875) \rightarrow N\eta$ $(\Gamma_{13} \Gamma_2)^{1/2} / \Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
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60 ± 12 ANISOVICH 12A DPWA Multichannel

0.37 HICKS 73 MPWA $\gamma p \rightarrow p\eta$

N(1875) PHOTON DECAY AMPLITUDES

Papers on γN amplitudes predating 1981 may be found in our 2006 edition,
Journal of Physics, G **33** 1 (2006).

$N(1875) \rightarrow p\gamma$, helicity-1/2 amplitude $A_{1/2}$

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
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0.018 ± 0.010 ANISOVICH 12A DPWA Multichannel

-0.020 ± 0.008 AWAJI 81 DPWA $\gamma N \rightarrow \pi N$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.007 ± 0.008 SHRESTHA 12A DPWA Multichannel

0.012 PENNER 02D DPWA Multichannel

0.026 ± 0.052 DEVENISH 74 DPWA $\gamma N \rightarrow \pi N$

$N(1875) \rightarrow p\gamma$, helicity-3/2 amplitude $A_{3/2}$

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
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-0.009 ± 0.005 ANISOVICH 12A DPWA Multichannel

0.017 ± 0.011 AWAJI 81 DPWA $\gamma N \rightarrow \pi N$

• • • We do not use the following data for averages, fits, limits, etc. • • •

0.043 ± 0.022 SHRESTHA 12A DPWA Multichannel

-0.010 PENNER 02D DPWA Multichannel

0.128 ± 0.057 DEVENISH 74 DPWA $\gamma N \rightarrow \pi N$

NODE=B016R22

NODE=B016R22

NODE=B016R9

NODE=B016R9

NODE=B016R23

NODE=B016R23

NODE=B016R8

NODE=B016R8

NODE=B016R24

NODE=B016R24

NODE=B016R11

NODE=B016R11

NODE=B016R5

NODE=B016R5

NODE=B016235

NODE=B016235

NODE=B016A1

NODE=B016A1

NODE=B016A2

NODE=B016A2

N(1875) → nγ, helicity-1/2 amplitude A_{1/2}

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
0.007±0.013	AWAJI 81	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.055±0.021	SHRESTHA 12A	DPWA	Multichannel
0.023	PENNER 02D	DPWA	Multichannel
0.053±0.083	DEVENISH 74	DPWA	$\gamma N \rightarrow \pi N$

NODE=B016A3
NODE=B016A3***N(1875) → nγ, helicity-3/2 amplitude A_{3/2}***

VALUE (GeV ^{-1/2})	DOCUMENT ID	TECN	COMMENT
-0.053±0.034	AWAJI 81	DPWA	$\gamma N \rightarrow \pi N$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.085±0.031	SHRESTHA 12A	DPWA	Multichannel
-0.009	PENNER 02D	DPWA	Multichannel
0.100±0.141	DEVENISH 74	DPWA	$\gamma N \rightarrow \pi N$

NODE=B016A4
NODE=B016A4***N(1875) γp → ΛK⁺ AMPLITUDES***

$(\Gamma_i/\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $p\gamma \rightarrow N(1875) \rightarrow \Lambda K^+$		(E ₂₋ amplitude)	
VALUE (units 10 ⁻³)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2.29 ^{+0.7} -0.2	MART 00	DPWA	$\gamma p \rightarrow \Lambda K^+$
5.5 ± 0.3	WORKMAN 90	DPWA	
4.09	TANABE 89	DPWA	

NODE=B016240

$p\gamma \rightarrow N(1875) \rightarrow \Lambda K^+$ phase angle θ		(E ₂₋ amplitude)	
VALUE (degrees)	DOCUMENT ID	TECN	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-48 ± 5	WORKMAN 90	DPWA	
-35.9	TANABE 89	DPWA	

NODE=B016LP1
NODE=B016LP1

$(\Gamma_i/\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $p\gamma \rightarrow N(1875) \rightarrow \Lambda K^+$		(M ₂₋ amplitude)	
VALUE (units 10 ⁻³)	DOCUMENT ID	TECN	
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-6.7 ± 0.2	WORKMAN 90	DPWA	
-4.09	TANABE 89	DPWA	

NODE=B016LK2
NODE=B016LK2***N(1875) FOOTNOTES***

¹CUTKOSKY 80 finds a lower mass D₁₃ resonance, as well as one in this region. Both are listed here.

²The range given for DEANS 75 is from the four best solutions. Disagrees with $\pi^+ p \rightarrow \Sigma^+ K^+$ data of WINNIK 77 around 1920 MeV.

NODE=B016

NODE=B016;LINKAGE=D

NODE=B016;LINKAGE=E

N(1875) REFERENCES

For early references, see Physics Letters **111B** 1 (1982).

ANISOVICH	12A	EPJ A48 15	A.V. Anisovich <i>et al.</i>	(BONN, PNPI)
SHRESTHA	12A	PR C86 055203	M. Shrestha, D.M. Manley	(KSU)
BATINIC	10	PR C82 038203	M. Batinic <i>et al.</i>	(ZAGR)
ARNNDT	06	PR C74 045205	R.A. Arndt <i>et al.</i>	(GWU)
PDG	06	JPG 33 1	W.-M. Yao <i>et al.</i>	(PDG Collab.)
PENNER	02C	PR C66 055211	G. Penner, U. Mosel	(GIES)
PENNER	02D	PR C66 055212	G. Penner, U. Mosel	(GIES)
MART	00	PR C61 012201	T. Mart, C. Bennhold	
VRANA	00	PRPL 328 181	T.P. Vrana, S.A. Dytman, T.-S.H. Lee	(PITT+)
MANLEY	92	PR D45 4002	D.M. Manley, E.M. Saleski	(KSA) IJP
Also		PR D30 904	D.M. Manley <i>et al.</i>	(VPI)
ARNNDT	91	PR D43 2131	R.A. Arndt <i>et al.</i>	(VPI, TELE) IJP
WORKMAN	90	PR C42 781	R.L. Workman	(VPI)
TANABE	89	PR C39 741	H. Tanabe, M. Kohno, C. Bennhold	(MANZ)
Also		NC 102A 193	M. Kohno, H. Tanabe, C. Bennhold	(MANZ)
BELL	83	NP B222 389	K.W. Bell <i>et al.</i>	(RL) IJP
AWAJI	81	Bonn Conf. 352	N. Awaji, R. Kajikawa	(NAGO)
Also		NP B197 365	K. Fujii <i>et al.</i>	(NAGO)
CUTKOSKY	80	Toronto Conf. 19	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
Also		PR D20 2839	R.E. Cutkosky <i>et al.</i>	(CMU, LBL) IJP
SAXON	80	NP B162 522	D.H. Saxon <i>et al.</i>	(RHEL, BRIS) IJP
BAKER	79	NP B156 93	R.D. Baker <i>et al.</i>	(RHEL) IJP
WINNIK	77	NP B128 66	M. Winnik <i>et al.</i>	(HAIF) IJP
DEANS	75	NP B96 90	S.R. Deans <i>et al.</i>	(SFLA, ALAH) IJP
DEVENISH	74	PL 52B 227	R.C.E. Devenish, D.H. Lyth, W.A. Rankin	(DESY+) IJP
HICKS	73	PR D7 2614	H.R. Hicks <i>et al.</i>	(CMU, ORNL, SFLA) IJP

REFID=54041

REFID=54862

REFID=53552

REFID=51535

REFID=51004

REFID=49129

REFID=49130

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REFID=30067

REFID=30068

REFID=30064

REFID=40096

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REFID=30056

REFID=30378

REFID=30383

REFID=30837

REFID=30293